V.90 PCI Windows Modem (LHT)

User's Manual

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Do This First

Please read the following tips carefully before attempting to install your new modem.

For Windows 95 Installation

•   If you are replacing the modem in your computer system with this modem, be sure to remove all other modem drivers. Go to: **Start-Settings-Control Panel** and double-click on the **System** icon. Select the **Device Manager** tab. Double-click on the **Modems** icon in the device tree to show the modems installed. Highlight each modem listed by clicking once on the icon next to the modem and then click the **Remove** button. It is also a good idea to physically remove your old modem from the system. **Note:** *once you remove the old modem and its drivers from your system, you will need the old modem driver diskette if you wish to reinstall it at a later date.* Close the System Properties window and return to the **Control Panel**. Double-click on the **Modems** icon. If a *New Hardware* Panel comes up, click **Cancel**. If your old modem is listed, highlight the modem and click the **Remove** button. Shutdown and turn off the computer. Wait 5 seconds before turning the system back on.
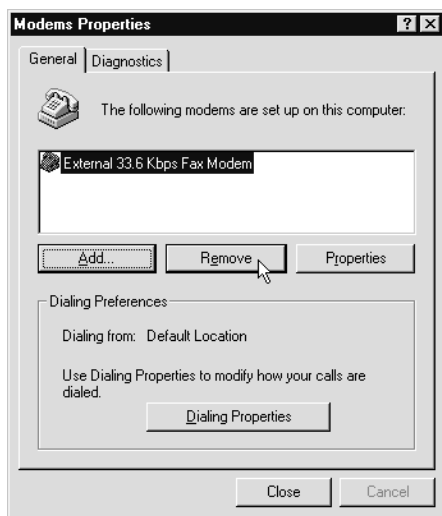

Figure 1: Win95 Modems Properties Panel

•   If you are going to use the TAM (Telephone Answering Machine) functions of the modem, you need to install the Unimodem V components of Windows 95. If you have Windows 95 OEM Service Release 2 (Version 4.00.950 B or above) you do not need to install this component as it is already built into the operating system.

To find the Windows 95 Version on your system, select: **Start-Settings-Control Panel.** Double-click on the **System** icon. If the version of Windows 95 is 4.00.950 or 4.00.950A, go to: **Start-Programs** and select **Windows Explorer**. Go to the UNIMODEM directory of the CD-ROM (the UNIMODEM driver is sometimes supplied on a separate floppy) that came with your modem and right-click on **UNIMODV.INF** (or **UNIMODV**, whichever is displayed) then click on **Install**. Restart your computer to enable the drivers.

• In order to support older software, the modem will always be assigned to COM 4. This port assignment is made by Windows 95 based on instructions contained in the .INF file supplied with the modem. Check your Windows 95 **Device Manager** and verify that COM 4 is not listed.

Go to **Start-Settings-Control Panel**. Double-click on the **System** icon, and select the **Device Manager** tab**.** From the device tree, double-click the **Ports [COM & LPT]** icon to expand the **Ports** tree. COM 1 and COM 2 should be listed. If COM 4 is listed, it must be made available as the modem will be automatically assigned to this port. A COM 4 listing in Device Manager usually means that there is a piece of hardware using the port. Highlight COM 4 by clicking once and then click the **Remove** button. After the port has been removed, click the **Refresh** button. If the COM 4 listing returns, you have a hardware device using the port. Reinstall the device to another COM Port.

• (Note: If you are not familiar with changing the settings within your system BIOS setup, you should skip the following system preinstallation procedure and go to the **Installing the Modem** section. Refer back to this area only if you have a problem with installing the modem.)

Although it is possible for a PCI card to share interrupts, it is recommended that you have one free IRQ available in your computer. The modem needs one IRQ and two I/O Addresses to function. To check for any available interrupts in your system, go to **Start-Settings-Control Panel**. Double-click the **System** icon and select the **Device Manager** tab. Click the **Properties** button to view the **System Resources**. Their are 16 (0-15) interrupts available in a system. Make a note of any interrupt not listed. To make sure that an available interrupt is assigned to the PCI bus, go to your system BIOS Setup routine and find the Plug-N-Play settings. These settings can be found within the *Advanced, PNP/PCI Configuration,* or *Plug and Play Configuration* sections depending on the BIOS Manufacturer. Next, verify that one <u>free</u> IRQ has been set so that the PCI bus has access to it (some BIOS don't allow individual selection of interrupts to ISA, Plug-N-Play, or PCI). These settings can be called ICU, ICU/PCI, PCI, or PNP depending on your BIOS version and manufacturer. Do not set this interrupt to "ISA" only or to "Legacy ISA". Pay attention to the IRQ usage of the other peripherals in your system.

Do not reassign an interrupt that is already in use by an ISA card to the PCI bus. Since each BIOS manufacturer has a different way of handling these configurations, you may have to use trial-and-error to get your modem properly configured. **Be sure to Save the settings before exiting the BIOS Setup.**

• You are now ready to install the modem. Proceed to the **Installing the Modem** section.

FOR WINDOWS NT 4.0 INSTALLATION

• If you are replacing the current modem in your computer system with this new modem, be sure to remove all other modem drivers from your operating system. Go to: **Start-Settings-Control Panel** and double-click on the **Modems** icon. Highlight the modem you wish to remove and click the **Remove** button. Shutdown the computer, power-down, and physically remove the modem from your system. Do not install your new modem at this time. Follow the procedures below to help insure a trouble-free installation. **Note:** *once you remove the old modem and its drivers from your system, you will need the old modem driver diskette if you wish to reinstall it at a later date.*

• Determine that your operating system has the latest upgrade available. "Service Pack 3" (or greater) should be installed. Go to **Start- Settings-Administrative Tools-Windows NT Diagnostics**. Select the **Version** folder. "Service Pack 3" (or greater) should be stated. If you do not have the latest service pack upgrade installed, it must be obtained from Microsoft. The latest upgrade can be downloaded from the Microsoft ftp site.

• (Note: If you are not familiar with changing the settings within your system BIOS setup, you should skip the following system preinstallation procedure and go to the **Installing the Modem** section. Refer back to this area only if you have a problem with installing the modem.)

Check your system BIOS IRQ assignments and make sure that at least two interrupts (especially any unused interrupts) have been assigned to the PCI bus. Go to your system BIOS Setup routine and find the Plug-N-Play settings. These settings can be found within the ***Advanced, PNP/PCI Configuration,*** or ***Plug and Play Configuration*** sections depending on the BIOS Manufacturer. Next, verify that at least two IRQs have been set so that the PCI bus has access to them (some BIOS don't allow individual selection of interrupts to ISA, Plug-N-Play, or PCI). These settings can be called ICU, ICU/PCI, PCI, or PNP depending on your BIOS version and manufacturer. Do not set all the interrupts to "ISA" only or to "Legacy ISA". Pay attention to the IRQ usage of the other peripherals in your system. Do not reassign an interrupt that is already in use by an ISA card to the PCI bus.

Installing The Modem

HARDWARE INSTALLATION

1. **Switch off** the computer and all peripheral devices connected to it.

2. Unplug the computer power cord from the wall receptacle.

3. Remove the computer's cover. Refer to your computer owner's manual for instructions.

4. Remove the screw securing the expansion slot cover behind one of the computer's available PCI expansion slots. Lift the expansion slot cover out as shown below.
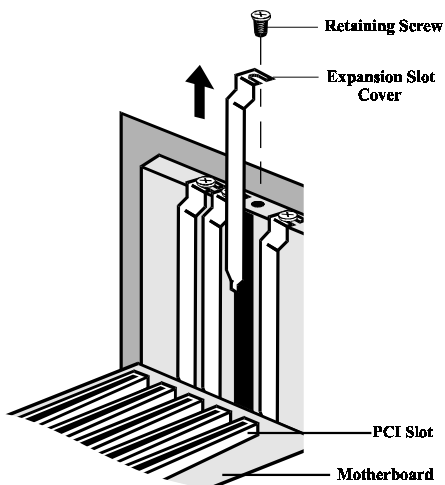
Figure 5: Removing the Backplate

 Always discharge static electricity before handling your modem. You may discharge static electricity by touching a grounded metal structure or by using any commercially available grounding strap.

Make sure the expansion slot type is PCI, which has a smaller slot to fit the PCI modem card. These connectors are usually white in color. ISA card slots have larger connectors and are nearly always black in color.

The position and colors of the expansion slots in your computer may differ from the illustrations shown in **Fig. 7** or **Fig. 8**, but the installation procedure should be the same.

5. Firmly, but gently, insert the modem into the available PCI expansion slot. Ensure that the card is seated properly before securing it with the screw removed in Step 4, as shown in the following diagram:
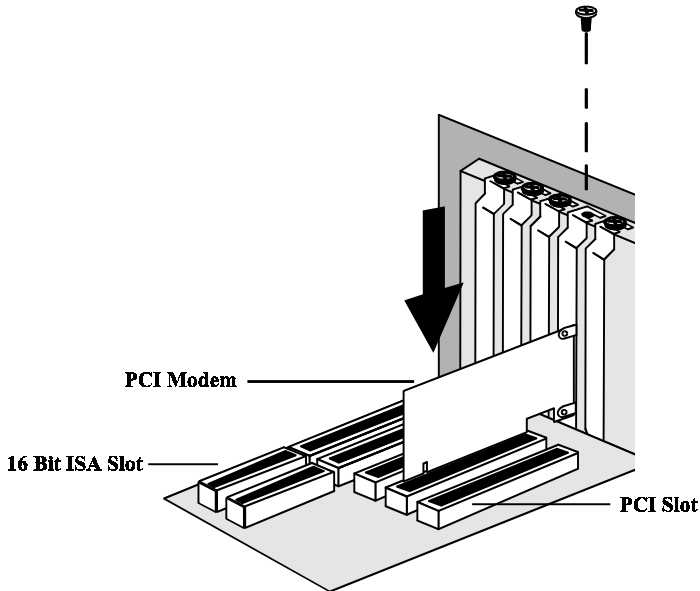
Fig. 6: Installing The Modem

6. Put the chassis cover back on the computer.

7. Be sure that all power switches are in the **OFF** position, then reconnect the power cables to the computer and its peripherals.

8. Connect the telephone line cable to the *Line* (*Telco*) jack as shown in **Fig.7**.

9. Turn on the computer and proceed to the following sections to configure your modem to the operating system you are using.
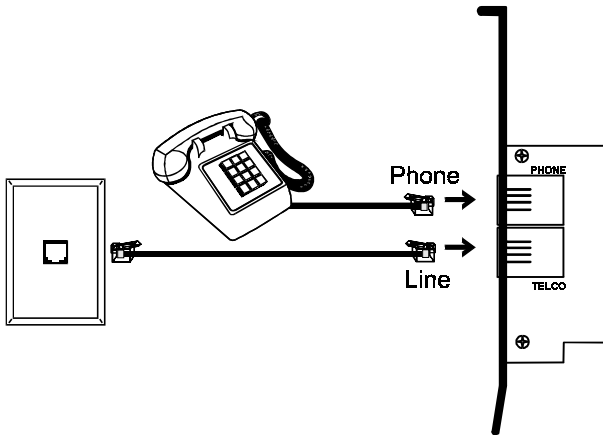
Fig.7: Connecting Devices

On the rear panel of your modem are input jacks to connect devices to the modem. As shown in the diagram, there are jacks for connection to a *phone* and to a phone *line*. The connector labeled *Line* (*Telco*) is meant to be connected to a standard analog phone line. To help reduce the load on your phone line, it is recommended that the modem be the only device connected. You should remove all other devices from your telephone line while the modem is in use.

CONFIGURING WINDOWS 95

Step 1   Upon startup, Windows 95 detects the modem and displays the **New Hardware Found** dialog box.

Select "Driver from disk provided by hardware manufacturer" then Click **OK**.

Step 2   If Windows asks for an installation disk, click **OK** and type *A:* in the dialog box that appears and click **OK**.
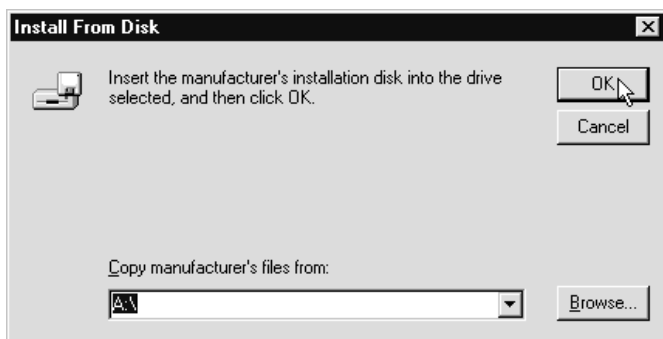
Step 3   After the installer has copied the .INF files to the hard disk, a **New Hardware Found** dialog box should appear prompting for the "Wave Device for Voice Modem". Click **OK**. (see **Do This First** for information on UNIMODEM.INF if the following screen does not appear).

New Hardware Found

Wave Device for Voice Modem

Select which driver you want to install for your new hardware:

○ Windows default driver

● Driver from disk provided by hardware manufacturer

○ Do not install a driver (Windows will not prompt you again)

○ Select from a list of alternate drivers

[OK] [Cancel] [Help]

Step 4   Click **OK** to copy the Wave Device .INF file from the A:\ drive (or CD-ROM Drive) to the hard drive.

Step 5   To determine what COM port and IRQ is assigned to the modem in Windows 95, click on the **Modems** icon in **Control Panel** and select the **Diagnostic** tab. Click on the COM Port icon next to the modem and then click on the **More Info** button to view the modem properties.

Modems Properties

General | Diagnostics

Windows detected the following ports, and has already installed the following devices:

Port	Installed
COM1	No Modem Installed.
COM2	No Modem Installed.
COM4	V.90 PCI Windows Modem (LHT)

[Driver] [More Info...] [Help]

[Close] [Cancel]

CONFIGURING WINDOWS 95 OEM SR2

Step 1   Upon startup, Windows 95 detects the modem and launches the **Update Device Driver Wizard** dialog box. Insert the diskette containing the modem's Windows 95 .INF files and click **Next >.**

Step 2   After Windows 95 has found the updated drivers for your modem, click **Finish**.

Step 3   If Windows asks for an installation disk, click **OK** and type *A:* in the dialog box that appears and click **OK**.
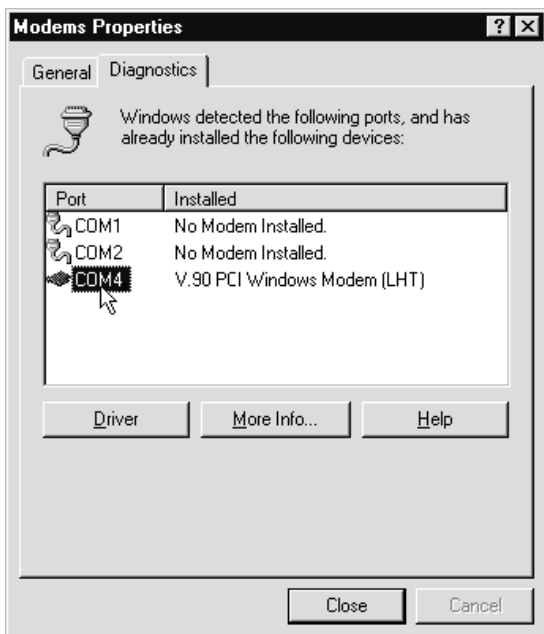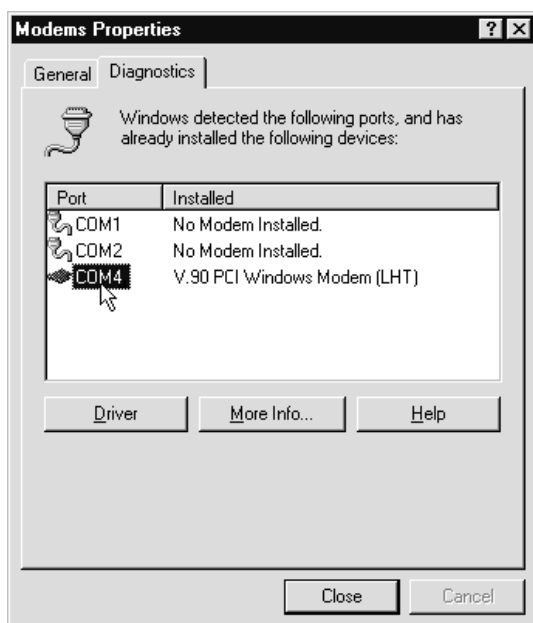
Step 4   After the Wizard has copied the .INF files to the hard disk, it should detect "Wave Device for Voice Modem" and prompt for its driver. Click **Next>**.

Update Device Driver Wizard

This wizard will complete the installation of:

Wave Device for Voice Modem

by searching your local drives, network, and Internet locations for the most current driver.

If you have a disk or CD-ROM that came with this device, insert it now.

It is recommended that you let Windows search for an updated driver. To do this, click Next to continue.

< Back   Next >   Cancel

Step 5   Click **Finish** to copy the Wave Device .INF file from the A:\ drive (or CD-ROM Drive) to the hard drive.

Update Device Driver Wizard

Windows found the following updated driver for this device:

Voice Modem Serial Wave Device

If you want to use this driver, click Finish. If this is not the correct driver and you want to search for a different driver manually, click Other Locations.

Location of Driver

A:

Other Locations...

< Back   Finish   Cancel

Step 6   To determine what COM port and IRQ is assigned to the modem in Windows 95, click on the **Modems** icon in **Control Panel** and select the **Diagnostics** tab. Click on the COM Port icon next to your modem and then click on the **More Info** button to view the modem properties.

Modems Properties ? X

General | Diagnostics |

Windows detected the following ports, and has already installed the following devices:

Port	Installed
COM1	No Modem Installed.
COM2	No Modem Installed.
COM4	V.90 PCI Windows Modem (LHT)

[Driver] [More Info...] [Help]

[Close] [Cancel]

Step 7   Remember this COM port number. When you install your Data/Fax software or internet browser program, you may need to set your modem port location to this same number.

CONFIGURING WINDOWS NT 4.00

In order to install the modem in Windows NT, you must prepare the installation utility supplied on a separate floppy diskette. This diskette should be labeled *Windows NT Installation Utility*. This program will allow for easy installation and uninstallation of your PCI Windows Modem.

Step 1   Install your modem into an available PCI slot (see the **Do This First** section for important preinstallation information).

Step 2   Insert your modem's Windows NT installation diskette into your computer's Floppy Disk Drive.

Step 3   Copy the self-extracting installation file into a temporary directory on your computer's default Hard Drive.

Step 4   Go to: **Start-Programs** and select **Windows Explorer**. Go to the temporary directory where you stored the self-extracting installation file and double-click on the **pm504.exe** file. After the file self-extracts, double-click the **setup.exe** file.

Step 5   The installation utility will show a welcome panel. Read the warning notice and close any open programs before beginning the installation. Click **Next>**.
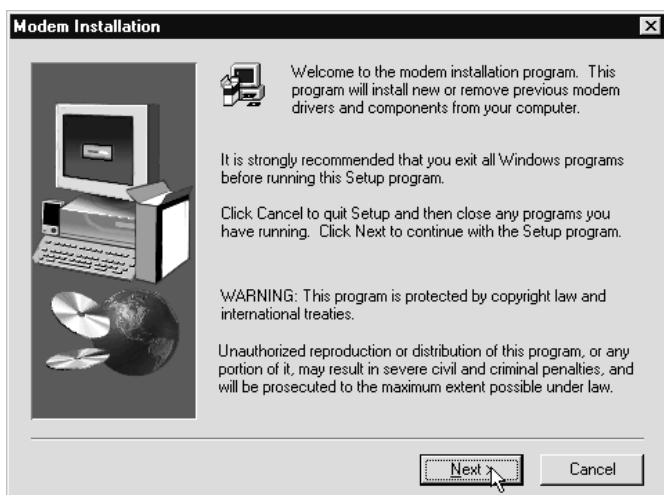
Step 6   The next step in the installation process offers an install or remove option. Select *Install new modem drivers and components*. Click **Next>**.
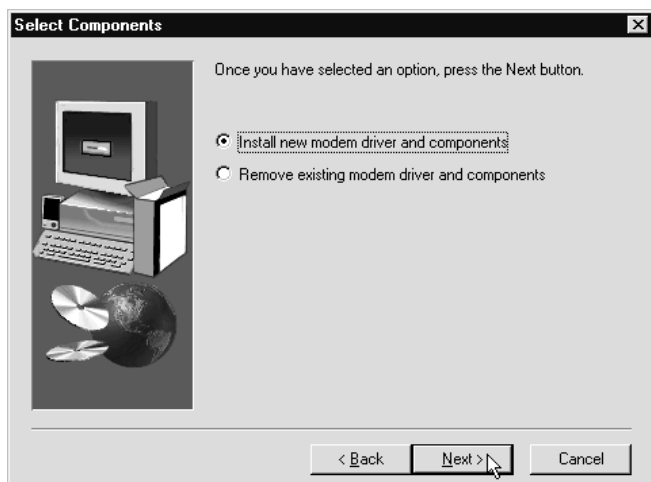
Step 7 After the installation utility has finished installing the drivers, restart your computer to enable the drivers.


Step 8 Click on the **Modems** icon in the **Control Panel**. Verify that Windows NT has correctly found the modem.

Step 9 If you wish to use your modem to dial into a Windows NT Remote Access Server or wish to connect to the Internet, you will need to configure Dial-up Networking. Go to: **Start-Settings-Control Panel** and double-click the **Network** icon. Click on the **Services** folder and select **Remote Access Service**. If the Remote Access Service option is not listed (if present, go to **Step 10**), click on the **Add** button. Scroll-down the menu and select **Remote Access Service**. Click on the **OK** button. Windows

NT may ask for its own disks or CD-ROM for some files. Insert as required. After you have installed Remote Access Service add the appropriate protocols as directed (i.e.. TCP/IP for Internet Access).

Step 10   At the **Remote Access Setup** dialog box, click on **Add….** Select the RAS Device you wish to add and Click **OK.**

Step 11   Click **Continue** to finish the Installation.
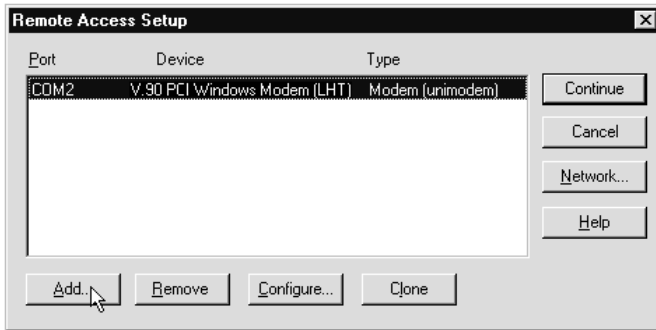
Step 12   After Windows NT has completed the binding process, allow Windows NT to shut down and restart the computer.

Installing and Configuring Communications Software

If your modem came with a communications software package, it is strongly recommended that you use this software for your modem. It's default installation parameters have been specially configured to work with this modem. The Users Guide for this program can be found inside the modem package. It can be supplied in either soft-bound copy or on CD-ROM (depending on the model you purchased). Some configurations are packaged without communications software. Check your packaging to see if communications software is included.

If you wish to use another software package, please be sure that it supports this modem. Most Software Manufacturers have a listing of supported modems on their websites or BBS's. Check these sites to see if this model is supported. If you are unsure or your brand of software supports only a few modems, try selecting "Hayes Compatible" or "Standard Modem". This may work in certain cases.

Some software programs allow manual input of parameters. For the users of these programs, here is a listing of the Data/Fax/Voice Command Standards supported.

Data: TIA/EIA-602
Fax: TIA/EIA-578 for Class 1 Fax
Voice: TIA IS-101 support for TAD (Telephone Answering Device)
Init String: **AT&F&C1&D2W2**

TIA IS-101 Commands <u>not</u> supported:
Caller ID
Full Duplex Speakerphone
VoiceView

Note: some programs must be configured to communicate with the modem on the same COM port and or IRQ setting used by the modem. See the **Installing the Modem** section for instructions on how to determine your COM Port and IRQ settings.

Using the Modem's Voice Features

This modem supports TIA IS-101 commands applicable to a Telephone Answering Device. In order to take advantage of this feature, you will need a Sound Blaster® compatible sound card equipped with an external microphone and external speakers. A software application; such as the one supplied with the modem; which supports these TAD functions is also required.

A modem based Telephone Answering Machine works by using a sound card equipped with a microphone to record an outgoing message. This message is stored as a .wav file which is transferred to the modem by the application program when an incoming call is detected. The modem's internal electronics converts the digital information contained in the .wav file into an audio signal which is then sent over the phone line. The person calling hears your outgoing message and responds with an incoming message.

The sequence of recording an incoming message is the reverse of an outgoing message. The modem's internal electronics converts the audio signal into a digital format and sends it to the application program. The application program then formats and stores the incoming message as a .wav file. When you play back your stored messages by selecting them from within the application program, they are sent to the sound card. You then hear your recorded messages through the sound card's speakers.

The process is simple in concept but it's success is totally dependant on the application program and it's ability to communicate with both the sound card and the modem. If you wish to use your modem as a Telephone Answering Machine, please try the software witch came with your modem. It's default parameters have been specially configured to identify and use your modems voice capabilities. Even if you have decided to use another third-party application, try your included application first. This will allow you to test the modem and it's voice functions before investing in an expensive retail software package. You may find that the supplied software performs just as well as an aftermarket software package.

Troubleshooting

This section lists some common problems and offers suggestions for a solution. It is important to remember that this modem is a Windows 95/NT based modem and requires 32bit virtual device drivers. It therefore cannot work in Windows 3.1 which cannot use these drivers. The modem also cannot work in DOS regardless of version. It is a software installed device and has no provisions for manual configuration.

If you cannot find your particular symptom listed here, it is suggested that you remove the modem and its drivers from the system and reinstall them again (see *Uninstalling the Modem* later in this section). This provides a "clean" installation and can cure many temporary problems. Be sure to check the **Do This First** section for important system preparation information before reinstalling the modem.

Most problems encountered during the Windows 95/NT installation process are a result of insufficient system preparation. For this reason it is strongly recommended that you carefully follow the preinstallation procedures outlined in the **Do This First** section. These steps have been thoughtfully chosen to help minimize difficulties during the installation of the modem in both Windows 95 and Windows NT 4.00. Take seriously the recommendation to physically remove any previously installed modems from your system. This step alone can help prevent many potential problems from occurring.

If your modem has installed but is not functioning, try the troubleshooting procedure listed below. The information provided by following these steps can help point the way to fixing your difficulty.

Windows 95

STEP 1: Check System Resources.

Go to **Start-Settings-Control Panel** and double-click the **System** icon. Select the **Device Manager** tab. From the device tree, double-click the **Modems** icon to show what modems are installed. If there is no **Modems** icon, your modem did not install (see *Does Not Install* section). If your modem is listed, check that there is no yellow exclamation mark or red "X" over the modem's telephone icon (if there is, go to *STEP 2*). If any other modems are listed, highlight the modem by clicking once on the telephone icon next to the listed modem and then click on the **Remove** button. Shutdown the system and turn off the power. Wait 5 seconds and turn your computer back on and repeat *STEP 1*.

STEP 2: Check Modem Properties.

From the **Device Manager** tab within **System Properties**, double-click the **Modems** icon in the device tree to show what modems are installed. Highlight your modem by clicking once on the icon and then click the **Properties** button. Read the *Device Status* under the **General** tab to see if the device is working properly. Check the *Device Usage* box and make sure there is <u>no</u> check mark on *"Disable in this hardware profile"* (Windows 95 OEM SR2 only) or (for Windows 95 or 95a) the box labeled "*Original Configuration, Current*" <u>has</u> a check mark . If either of these conditions are present, correct them. Make a note of the Com Port and IRQ the modem is using. If the *Device Status* box shows some error message, it will generally be about a conflict. Go to the *Resources* tab and read the *Conflicting Device List*. If a conflict is present, uncheck the box *"Use automatic settings"* and select a configuration that does not cause conflicts. Manually change the IRQ settings if needed (see your Windows 95 on-line help file for a more detailed discussion on changing these settings). Click on the **OK** button. If there is no setting free of conflicts, go to the *Does Not Install* section.

STEP 3: Modem Diagnostics.

Go to **Start-Settings-Control Panel** and double-click the **Modems** icon. Your modem should be listed. If any other modem is listed, click once on each old modem and then click the **Remove** button. It is a good idea to shutdown Windows 95, turn off your computer, wait 5 seconds and turn the power back on (do not use the *Shutdown and Restart* option). Return to *STEP 3: Modem Diagnostics* and click on the *Diagnostics* tab. Highlight the modem by clicking once on the *Com Port* icon next to its listing. Now click on the **More Info** button. You should see the panel below.
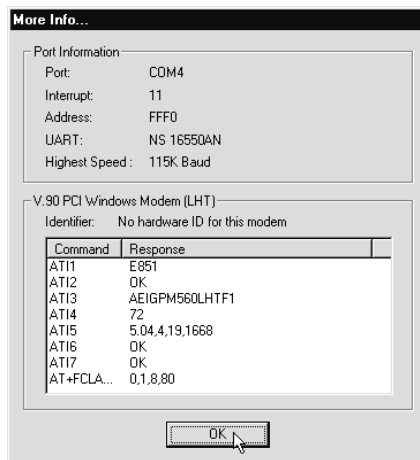

Figure 8: More Info Panel

If you receive an error message or the panel is blank, go to the *Does Not Install* section.

STEP 4: Does Not Install.

The most likely reason for a non-installation in Windows 95 is a lack of IRQ resources. The modem needs one IRQ and two I/O addressees in order to function. Modern computer systems are usually equipped with soundcard, CD-ROM drive, Hard-drive, floppy drive, video card, two COM Ports, one LPT port, keyboard, and a mouse. Each of these devices require at least one IRQ (interrupt) in order to function. Some models of sound card require three interrupts. It is little wonder that when it comes time to install a modem, there is nothing left. The addition of special purpose peripherals (SCSI, Network cards, etc.) makes matters worse. This section deals with the process of freeing IRQ's and configuring the system P-N-P (Plug-N-Play) which requires that you know how to enter your computer system's BIOS Setup Routine (read your computer user's manual for information on how to invoke and use the BIOS setup).

Once inside the BIOS Setup, find the Plug-N-Play configuration. This can be found within the *Advanced, PNP/PCI Configuration,* or *Plug and Play Configuration* section depending on the BIOS Manufacturer. Next, from the information you noted in *STEP 2: Modem Properties*, find the interrupt selection for the IRQ your modem is using (some BIOS don't allow individual selection of interrupts to ISA, Plug-N-Play, or PCI). You want to set this so that the PCI bus has access to this interrupt. This can be called ICU/PCI, PCI, or PNP depending on your BIOS version and manufacturer. Do not set this interrupt to "ISA" only or to "Legacy ISA". Since each manufacturer has a different way of handling this configuration, you may have to use trial-and-error to get your modem properly configured.

If you do not have any free interrupts available, you will have to disable some unused function of your computer system. If you are using a PS/2 style mouse, you probably can spare one of your internal COM Ports. To disable a COM Port, find the BIOS Setup section for *Integrated Peripherals*. Locate the *Serial Port* settings and disable an **unused** port that has nothing connected to it (usually serial port 2). This should free one IRQ for your modem to use. You may also have to disable the COM Port in Windows 95.

Special Situations: Under some situations, you will find that freeing an interrupt does not solve your installation difficulties. This could be due to another peripheral device stealing the interrupt you just provided.

Certain full-featured sound cards require three IRQs to support all their functions. When one becomes available, they take it. This situation requires that you remove your sound card, <u>free an interrupt</u>, install the modem and verify its operation, and then reinstall the sound card. This procedure may also work for sound cards that have lost their sound after the modem has been installed or if the modem will not install in a system with a sound card.

Uninstalling the Modem: If you are uninstalling the modem in Windows 95 in order to upgrade your drivers or to obtain a "clean" reinstallation, it is important to follow these directions carefully. Because this modem uses virtual device drivers, following these instructions out of sequence will result in "freezing" your system. (note: For Windows NT, use the installation utility on the Windows NT installation diskette. The utility has an option to remove your modem drivers.)

1) Within Windows 95, go to **Start-Settings-Control Panel** and double-click the **System** icon. Select the **Device Manager** tab. From the device tree, double-click the **Modems** icon to expand the modems tree. Highlight your modem by clicking once on the icon next to your modem and then click the **Remove** button.

2) Go to **Start-Settings-Control Panel** and double-click the **Modems** icon. If your modem is listed, highlight the modem by clicking once on the icon next to the modem and then click the **Remove** button. Or, if the *New Hardware* panel comes up, click on the **Cancel** button. (Note: Your modem should not be listed in the **Modems** section after you have deleted it from the **Device Manager**. This could be a sign that your Plug-N-Play settings are not correct. See the *Does Not Install* section for info about Plug-N-Play).

3) Close all open window panels and return to the Windows 95 desktop screen. Go to **Start-Find-Files or Folders** and search for the following files which the modem uses. Type in the name and extension (i.e.. ltwave.inf) and click on the **Find** button. Once you find each of the files listed, highlight the file by clicking once on the file name and then go to <u>F</u>ile-<u>D</u>elete. Delete all occurrences of these files. (Do not delete these files from your modem installation diskette. You will need your diskette to reinstall the modem).

ltcom.vxd	ltwave.inf
ltmodem.vxd	ltdfv.inf
ltvcd.vxd	ltdt.inf
ltmodem.sys	ltports.inf
ltdsvd.dll	

If you cannot find a particular file, it usually means it was not installed. After all instances of these files have been deleted, restart your system.

Windows 95 and 95a users see below.

If you are using Windows 95 OEM SR2 (see the **Do This First** section for Windows 95 for instructions on how to determine your Windows 95 version), you need only delete the files listed. In the case of Windows 95 or Windows 95a, there are two additional files which Windows 95 or Windows 95a generates when installing a piece of hardware from an OEM. The file is called oem#.inf. The number (#) used is generated by Windows 95 each time an additional piece of hardware is installed. In the case of the modem, these files could have any number between 1 and 99. i.e. oem8.inf.

To find these files, go to **Start-Find-Files or Folders**. At the first screen, type in *.inf* in the **Named:** box. Make sure your entire drive is selected and not just one subdirectory. Place a check mark in the **Include subfolders** box. Be sure all the information is typed in as shown below. Before beginning the search, select the **Advanced** tab.
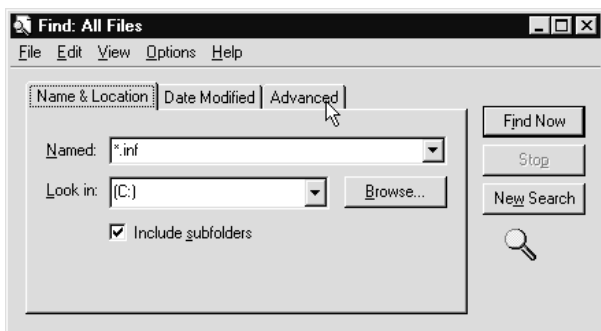
At the Advanced settings window, type the following in the **Containing text** field: *V.90 PCI Windows Modem*. Click on the **Find Now** button.
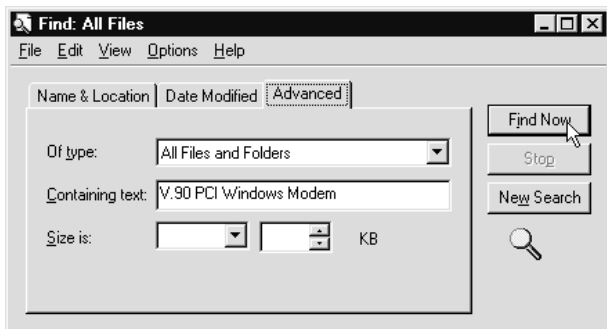
When a file is found, it will have the name *oem#.inf*. Delete only an oem inf file. To delete a file, highlight the file name by clicking once and then select **File-Delete** from the File menu. After the file is deleted, you now need to find the other inf file. Go to the **Advanced** tab and type the following in the **Containing text** field: *V.90_PCI_Windows_Modem* as shown below.
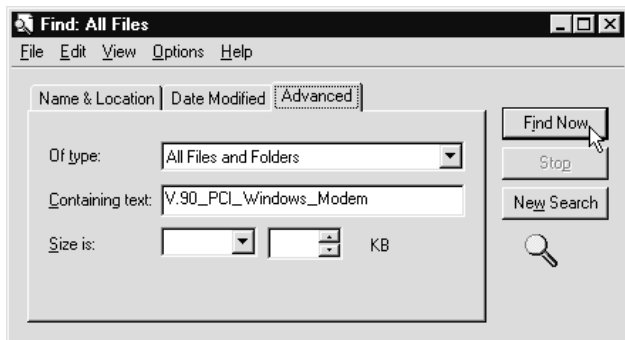
After Windows finds the other file, delete it as before. Restart your system and follow the installation procedures outlined in the **Installing the Modem** section.

Windows NT

Windows NT 4.00 installation problems are always due to inadequate preparation. The following conditions must be meet before attempting to install the modem or it will not be seen or correctly installed by the system. (see the **Do This First** section at the beginning of this manual).

1) You must have the latest Windows NT Service Pack upgrade installed.
2) There must be a free IRQ and two I/O Port Addresses available for the modem to use.
3) The installation utility must be copied from the installation diskette to the default hard drive and extracted.

If you need help on freeing an interrupt or making a COM Port available, see the Windows 95 *Does Not Install* section for a discussion of this topic. The *Special Situations* and *Plug-N-Play BIOS* sections also apply to Windows NT 4.00. See these areas for guidelines. Do not use the procedure in Windows 95 for uninstalling the modem. If you are upgrading or removing the drivers, use the installation utility on the Windows NT installation diskette that came with your PCI modem. This utility has an option for removing the modem drivers.

No Dialtone Error

Make sure you have connected the phone cable into the right connector on the back of the modem. See **Figure 7: Connecting Devices**.

You may have too many devices connected to the phone line. Remove all other equipment.

Your modem may not recognize overseas dialtone. Use ATX0 to have the modem ignore (not look for) the dialtone before dialing.

Communications Software Does Not Work

Some communications software packages need to be configured to the same COM Port and or IRQ as the modem. See the **Installing the Modem** section for information on how yo determine your COM Port and IRQ number.

Does the communications software support this modem? See the **Installing and Configuring Communications Software** section.
If you are using a different software from the one supplied with the modem (some models of this modem may be shipped without communications software), try installing the supplied software and verify its functionality with the modem.

Nothing Appears On The Screen When I Type

Issue the command *ATE1* to the modem to enable command echo. This will let you see what you type.

Can't Connect at 56K

Note: Current FCC regulations limit your maximum connection rate to 53Kbits / s.

The number you are calling may not support V.90 or K56flex protocols. Some ISP's (**I**nternet **S**ervice **P**roviders) have special numbers that you must call to connect to 56K. Contact your service provider and ask if the number you are calling supports V.90 or K56flex connections to their service.

Check the maximum speed setting in the **Modem Properties** window. Go to **Start-Settings-Control Panel** and double-click the **Modems** icon. Highlight your modem by clicking once on the icon next to the modem and then click the **Properties** button. Select the **General** tab and look at the setting in the *Maximum speed* box. Make sure this is set to 115200.

You may have other telephone devices connected to the phone line. To help your modem achieve the best connection possible, remove all extra devices connected to the telephone line when the modem is in use. This includes extension phones, answering machines, cordless phone bases, caller ID boxes, etc. Don't just disconnect the phone cable from the units. Disconnect the phone cable from the wall. This reduces the load on your phone line and keeps signal attenuation to a minimum. Not having loose phone line cords coming from your phone line sockets will help reduce the possibility of interference being transmitted to the phone line.

Keep the length of your phone line cable to 10 feet or less. Don't use an unusually long cable to connect to the phone line socket. If necessary, move the computer closer to the phone socket. Don't lay your cabling close to an electrical appliance like a refrigerator or air conditioner unit. High current devices can transmit 60 cycle "hum" to your modem through the phone cord. This may cause frequent renegotiations or line disconnects while the appliance is running.

The telephone line conditions at the time of your call may not let you connect at 56K. The modem has a connection sequence of K56flex, then V.90, then V.34, and so on. The modem attempts to make the highest connect rate that your telephone line can support at the time of negotiation. If the line conditions (noise, telephone company routing, etc.) won't allow a high data rate connection, then the modem will automatically connect at the most reliable rate. Try making the call again after a few minutes. The routing of the call may improve your chances of making a 56K connection.

If you are attempting to make a call from an office, are you using a direct outside line or are you using a PBX hookup? If you have to dial "9" to reach an outside number, you are using a PBX. The modem cannot connect faster then V.34 if you are using a PBX. Try using the line that is connected to a fax machine. Fax machines are usually connected to a dedicated line and not through the PBX.

Your phone line may not support a 56K connection. Or may support a 56K connection only intermittently. There are many conditions that must be met before a 56K connection can be established. The telephone company must have you connected to the PSTN (**P**ublic **S**witched **T**elephone **N**etwork) in a particular way. The modem you are calling must support the same protocol. The phone line must be free of distortion and noise. The phone wiring in your house or building must be in good condition and so on. Check to see if you have good voice communications while talking to friends or relatives. Do their voices sound distorted? Do you

hear a "hissing" or "humming" sound in the background? Is there "popping" or "crackling" during your call? These are phone line problems. In the case of distortion, your phone line is bad. Humming may be due to the cabling inside your residence coming too close to a high current appliance or you may have a cordless phone recharger base connected to the phone line. Popping or crackling usually indicates a loose connection to the outside line or water dripping on the hookup outside your house. Some of these problems can be fixed. Some cannot.

The drivers for your modem are constantly being refined to address problems with compatibility, interoperability, and performance. Conditions that were thought insurmountable only months ago are now things of the past. As the industry converts to the new V.90 standard, current problems of connectivity and interoperability could also be things of the past. Check for driver upgrades on a regular basis. A problem connecting to a particular provider might be fixed by a simple software upgrade.

Appendix A: AT Command Set

AT Commands

AT commands are issued to the modem to control the modem's operation and software configuration. AT commands can only be entered while the modem is in command mode. The format for entering AT commands is:

TYPE: **ATXn**

where X is the AT command, and n is the specific value for that command.

PRESS: **Enter**

Any command issued is acknowledged with a response in text format known as result codes. For multiple AT commands in the same command line, the commands are executed in the order received from the DTE. Should execution of a command result in an error, or a character not be recognized as a valid command, execution is terminated, the remainder of the command line is ignored, and the ERROR result code is issued. Otherwise, if all commands execute correctly, only the result code associated with the last command shall be issued; result codes for preceding commands are suppressed.

In the following listing, all commands and command values accepted by the modem are shown; any entries other than those shown cause the ERROR result code.

+++ **Escape sequence**

The escape sequence allows the modem to exit data mode and enter on-line command mode. While in on-line command mode, you may communicate directly to your modem using AT commands. Once you are finished, you may return to data mode using the ATO command. A pause, the length of which is set by the Escape Guard Time (S12), must be used after an escape sequence is issued. This pause prevents the modem from interpreting the escape sequence as data. The value of the escape sequence character may be changed using Register S2.

A/ **Repeat Last Command**

This command repeats the last command string entered. Do not precede this command with an AT prefix or conclude it by pressing Enter.

A **Answer Command**

This command instructs the modem to go off-hook and answer an incoming call.

Bn   **Communication Standard Setting**

This command determines CCITT vs. Bell standard.

B0:   Selects CCITT V.22 mode when the modem is at 1200 bits/s.
B1:   Selects Bell 212A when the modem is at 1200 bits/s (default).
B2:   Unselects V23 reverse channel (same as B3).
B3:   Unselects V23 reverse channel (same as B2).
B15:   Selects V.21 when the modem is at 300 bits/s.
B16:   Selects Bell 103J when the modem is at 300 bits/s (default).

Result Codes:

OK $n = 0, 1, 15, 16$
ERROR   Otherwise

Cn   **Carrier Control**

The modem will accept the C1 command without error in order to ensure backward compatibility with communications software that issues the C1 command. However, this modem does not support the C0 command. The C0 command may instruct some other modems to not send carrier (i.e., it puts them in a receive-only mode).

        C0:   Transmit carrier always off.
        C1:   Normal transmit carrier switching.

Result Codes:

OK $n = 1$
ERROR   Otherwise

Dn   **Dial**

This command instructs the modem to begin the dialing sequence. The dial string (n, including modifiers and the telephone number) is entered after the ATD command.

A dial string can be up to 40 characters long. Any digit or symbol (0-9, *, #, A, B, C, D) may be dialed as touch-tone digits. Characters such as spaces, hyphens, and parentheses do not count, they are ignored by the modem and may be included in the dial string to enhance readability.

The following may be used as dial string modifiers:

L   Redials last number. Should be the first character following ATD, ignored otherwise. The modem displays the dialing string in the following format: "Dialing…xxxxxxx" where "xxxxxxx" is the last number dialed.

P   Pulse dialing. (e.g. ATDPxxx. Dialing set to pulse as default.)

T   Touch-tone dialing (default). (e.g. ATDTxxx. Dialing set to tone as default.)

,   Pause during dialing. Pause for time specified in Register S8 before processing the next character in the dial string.

W   Wait for dial tone. Modem waits for a second dial tone before processing the dial string.

@   Wait for quiet answer. Wait for five seconds of silence after dialing the number. If silence is not detected, the modem sends a NO ANSWER result code back to the user.

!   Hook flash. Causes the modem to go on-hook for 0.5 seconds and then return to off-hook.

;   Return to command mode. Causes the modem to return to command mode after dialing the number, without disconnecting the call.

^   Disable data calling tone transmission.

S=n Dial a telephone number previously stored using the &Zn=x command (see the &Zn=x command for further information). The range of n is 0-3.

$ Bong tone detection.

En   Echo Command

This command controls whether or not the characters entered from your computer keyboard are echoed back to your monitor while the modem is in command mode.

    E0:   Disables echo to the computer.
    E1:   Enables echo to the computer (default).

Result Codes:

OK   n = 0, 1
ERROR   Otherwise

Fn   On-line Data Character Echo Command

This command determines if the modem will echo data from the DTE. This modem does not support the F0 version of the command. However, the modem will accept F1, which may be issued by older communication software, to assure backward compatibility.

F0:   Online data character echo enabled (NOT SUPPORTED, ERROR).
F1:   Online character echo disabled.

Result Codes:

OK   n = 1
ERROR   Otherwise

Hn   Hook Control

This command instructs the modem to go on-hook to disconnect a call, or off-hook to make the phone line busy.

H0:   Modem goes on-hook (default).
H1:   Modem goes off-hook.

Result Codes:

OK   n = 0, 1
ERROR   Otherwise

In   Request ID Information

This command displays specific product information about the modem.

I0:   Returns default speed and controller firmware version. (same as I3)
I1:   Calculates ROM checksum and displays it on the DTE (e.g., 12AB).
I2:   Performs a ROM check and calculates and verifies the checksum displaying OK or ERROR.
I3:   Returns the default speed and the controller firmware version. (same as I0)
I4:   Returns firmware version for data pump (e.g., 94).
I5:   Returns the board ID: software version, hardware version, and country ID.
I6   Response OK
I7   Response OK
I8   Response OK
I9:   Returns country code (e.g., North America Ver. 1).

Result Codes:

OK   n = 0-9
ERROR   Otherwise

Ln   Monitor Speaker Volume

This command sets speaker volume to low, medium, or high.

L0:   Selects lowest volume.
L1:   Selects low volume.
L2:   Selects medium volume (default).
L3:   Selects high volume.

Result Codes:

OK   n = 0, 1, 2, 3
ERROR   Otherwise

Mn   Monitor Speaker Mode

This command turns the speaker on or off.

M0:   The speaker is off.
M1:   The speaker is on until the modem detects the carrier signal (default).
M2:   The speaker is always on when modem is off-hook.
M3:   The speaker is on until the carrier is detected, except while dialing.

Result Codes:

OK   n = 0, 1, 2, 3
ERROR   Otherwise

Nn   Modulation Handshake

This command controls whether or not the local modem performs a negotiated handshake at connection time with the remote modem when the communication speed of the two modems is different.

N0:   When originating or answering, this is for handshake only at the com-
        munication standard specified by S37 and the ATB command.
N1:   When originating or answering, begin the handshake only at the com-
        munication standard specified by S37 and the ATB command. During
        handshake, fallback to a lower speed may occur (default).

Result Codes:

OK   n = 0, 1
ERROR   Otherwise

On   Return On-line to Data Mode

O0:   Instructs the modem to exit on-line command mode and return to data

mode (see AT Escape Sequence, +++).

O1:   This command issues a retrain before returning to on-line data mode.
O3:   This command issues a rate renegotiation before returning to online
data mode.

Result Codes:

| OK | n = 0, 1, 3 |
| ERROR | Otherwise |

P   **Select Pulse Dialing**

This command configures the modem for pulse (non-touch-tone) dialing. Dialed
digits are pulsed until a T command or dial modifier is received. Tone dial is the
default setting.

Qn   **Result Code Control**

Result codes are informational messages sent from the modem and displayed on
your monitor. Basic result codes are OK, CONNECT, RING, NO CARRIER, and
ERROR. The ATQ command allows the user to turn result codes on or off.

Q0:   Enables modem to send result codes to the computer (default).
Q1:   Disables modem from sending result codes to the computer.

Result Codes:

| OK | n = 0, 1 |
| ERROR | Otherwise |

T   **Select Tone Dialing**

This command instructs the modem to send DTMF tones while dialing. Dialed
digits are tone dialed until a P command or dial modifier is received. This is the
default setting.

Vn   **DCE Response Format**

This command controls whether result codes (including call progress and negotia-
tion progress messages) are displayed as words or their numeric equivalents.

V0:   Not supported. Results are always text.
V1:   Displays result codes as text (default).

Result Codes:

OK   n = 0, 1
ERROR   Otherwise

Wn   Result Code Option

W0:   CONNECT result code reports DTE speed. Disable protocol result codes.
W1:   CONNECT result code reports DTE speed. Enable protocol result codes.
W2:   CONNECT result code reports DCE speed. Enable protocol result codes (default).

Result Codes:

OK   n = 0, 1, 2
ERROR   Otherwise

Xn   Result Code Selection and Call Progress Monitoring

This command enables tone detection options used in the dialing process. As these functions are chosen, the modem chipset's result codes are also affected. Therefore, this command is frequently used to control the modem chipset's responses. The primary function of this control is to control the modem chip set's call response capabilities.

Extended Result Codes

Disabled: Displays only the basic result codes OK, CONNECT, RING, NO CARRIER, and ERROR.
Enabled: Displays basic result codes, along with the connect message and the modem's data rate, and an indication of the modem's error correction and data compression operation.

Dial Tone Detect

Disabled: The modem dials a call regardless of whether it detects a dial tone. The period of time the modem waits before dialing is specified in register S6.
Enabled: The modem dials only upon detection of a dial tone, and disconnects the call if the dial tone is not detected within 10 seconds.

Busy Tone Detect

Disabled: The modem ignores any busy tones it receives.
Enabled: The modem monitors for busy tones.

Ext.	Result Code	Dial Tone Detect	Busy Tone Detect
X0	Disable	Disable	Disable
X1	Enable	Disable	Disable
X2	Enable	Enable	Disable
X3	Enable	Disable	Enable
X4	Enable	Enable	Enable (default)
X5	Enable	Enable	Enable
X6	Enable	Enable	Enable
X7	Disable	Enable	Enable

Result Codes:

OK	n = 0, 1, 2, 3, 4, 5, 6, 7
ERROR	Otherwise

Yn   Long Space Disconnect

Long space disconnect is always disabled.

Y0: Disable long space disconnect (default).
Y1: Enable long space disconnect. (NOT SUPPORTED)

Result Codes:

OK	n = 0
ERROR	Otherwise

Zn   Recall Stored Profile

This command instructs the modem chip set to go on-hook and restore the profile
saved by the last &W command. Either Z0 or Z1 restores the same single profile.

Result Codes:

OK	n = 0, 1
ERROR	Otherwise

&Bn   **V.32 Auto Retrain**

This modem always auto retrains.

&B0: Disable V.32 auto retrain. (NOT SUPPORTED)
&B1: Enable V.32 auto retrain (default).

Result Codes:

   OK $n = 1$
   ERROR   Otherwise

&Cn   **Data Carrier Detect (DCD) Control**

Data Carrier Detect is a signal from the modem to your computer indicating that the carrier signal is being received from a remote modem. DCD normally turns off when the modem no longer detects the carrier signal.

&C0: The state of the carrier from the remote modem is ignored. DCD circuit is always on.

&C1: DCD turns on when the remote modem's carrier signal is detected, and off when the carrier signal is not detected (default).

Result Codes:

   OK $n = 0, 1$
   ERROR   Otherwise

&Dn   **DTR Control**

This command interprets how the modem responds to the state of the DTR signal and changes to the DTR signal.

&D0: Ignore. The modem ignores the true status of DTR and treats it as always on. This should only be used if your computer does not provide DTR to the modem.

&D1: If the DTR signal is not detected while in on-line data mode, the modem enters command mode, issues OK result code, and remains connected.

&D2: If the DTR signal is not detected while in on-line data mode, the modem disconnects (default). If this signal is not present, the modem will not answer or dial.

&D3: Monitor DTR signal when an on-to-off transition occurs, the modem per-
forms a soft reset as if the ATZ command was received.

Result Codes:

OK	n = 0, 1, 2, 3
ERROR	Otherwise

&Fn   Load Factory Settings

This command loads the configuration stored and programmed at the factory. This
operation replaces all of the command options and the S-register settings in the
active configuration with factory values.

&F0: Recall factory setting as active configuration. (default)

&Gn   V.22bis Guard Tone Control

This command determines which guard tone, if any, to transmit while transmit-
ting in the high band (answer mode). This command is only used in V.22 and
V.22bis mode. This option is not used in North America and is for international
use only.

&G0: Guard tone disabled (default).
&G1: Sets guard tone to 550 Hz.
&G2: Sets guard tone to 1800 Hz.

Result Codes:

OK	n = 0, 1, 2
ERROR	Otherwise

&Jn   Auxiliary Relay option

&J0: The auxiliary relay is never closed.
&J1: NOT SUPPORTED, responds ERROR.

Result Codes:

OK	n = 0
ERROR	Otherwise

&Kn   **Local Flow Control Selection**

&K0: Disable flow control.
&K1: Reserved.
&K2: Reserved.
&K3: Enable RTS/CTS flow control (default).
&K4: Enable XON/XOFF flow control.

Result Codes:

   OK   n = 0, 3, 4
   ERROR   Otherwise

&Mn   **Asynchronous Communications Mode**

&M0: Asynchronous mode (default).
&M1: Reserved.
&M2: Reserved.
&M3: Reserved.
&M4: Reserved.

Result Codes:

   OK   n = 0
   ERROR   Otherwise

&Pn   **Pulse Dial Make-to-Break Ratio Selection**

This Command is effective only for Japan.

&P0 39/61 make/break ratio, 10PPS
&PI 33/67 make/break ratio, 10PPS (default)
&P2 33/67 make/break ratio, 20PPS

Result Codes:

   OK   n = 0, 1, 2
   ERROR   Otherwise

&Qn   **Asynchronous Communications Mode**

&Q0: Asynchronous Mode, buffered. **Same as \N0.**
&Q1: Reserved.
&Q2: Reserved.

&Q3: Reserved.
&Q4: Reserved.
&Q5: Error Control Mode, buffered (default). **Same as \N3.**
&Q6: Asynchronous Mode, buffered. **Same as \N0.**
&Q7: Reserved.
&Q8: MNP error control mode. If an MNP error control protocol is not established, the modem will fallback according to the current user setting inS36.
&Q9: V.42 or MNP error control mode. If neither error control protocol is established, the modem will fallback according to the current user setting inS36.

Result Codes:

OK   n = 0, 5, 6, 8, 9
ERROR   Otherwise

&Sn   Data Set Ready (DSR) Option

This command selects DSR action.

&S0: DSR always ON (default).
&S1: DSR comes on when establishing a connection and goes off when the connection ends.

Result Codes:

OK   n = 0, 1
ERROR   Otherwise

&V0   View Active Configuration and Stored Profile

This command is used to display the active profiles.
&V0: View active file

Option	Selection	AT Cmd
Comm Standard	Bell	B
CommandCharEcho	Enable	E
Speaker Volume	Medium	L
Speaker Control	OnUntilCarrier	M
Result Codes	Enable	Q
Dialer Type	Tone	T/P
ResultCode Form	Text	V
ExtendResultCode	Enabled	X
DialTone Detect	Enable	X

BusyTone Detect	Enable	X
LSD Action	Standard RS232	&C
DTR Action	Standard RS232	&D

Press any key to continue; ESC to quit.

Option	Selection AT	Cmd
V22b Guard Tone	Disable	&G
Flow Control	Hardware	&K
Error Control Mode	V42, MNP, Buffer	\N
Data Compression	V42bis/MNP5	%C
AutoAnswerRing#	0	S0
AT Escape Char	43	S2
CarriageReturn Char	13	S3
Linefeed Char	10	S4
Backspace Char	8	S5
Blind Dial Pause	2 sec	S6
NoAnswer Timeout	50 sec	S7
"," Pause Time	2 sec	S8

Press any key to continue; ESC to quit.

Option	Selection AT	Cmd
No Carrier Disc	2000 msec	S10
DTMF Dial Speed	95 msec	S11
Escape GuardTime	1000 msec	S12
Data Calling Tone	Disabled	S35
Line Rate	33600	S37
DSVD mode	Disabled	-SSE

Press any key to continue; ESC to quit.

Stored Phone Numbers

&Z0=
&Z1= 101
&Z2=
&Z3=

OK

&Wn   **Store Current Configuration**

This command stores certain command options and S-register values into the modem's nonvolatile memory. The ATZ command or a powerup reset of the modem restores this profile.

Result Codes:

      OK   n = 0
      ERROR   Otherwise

&Yn   **Select Stored Profile for Hard Reset**

This command does not change the behavior of the modem but is included for compatibility with applications that issue the &Y0 command:

&Y0: Select stored profile 0 on powerup
&Y1: ERROR.

Result Codes:

      OK   n = 0
      ERROR   Otherwise

&Zn=x   **Store Telephone Number**

This command is used to store up to four dialing strings in the modem's nonvolatile memory for later dialing. The format for the command is &Zn = "stored number" where n is the location 0?3 to which the number should be written. The dial string may contain up to 40 characters. The ATDS = n command dials using the string stored in location n.

Result Codes:

OK   n = 0, 1, 2, 3
ERROR   Otherwise

\An   **Select Maximum MNP Block Size**

The modem will operate an MNP error corrected link using a maximum block size controlled by the parameter supplied.

\AO 64 characters.
\A1 128 characters.

\A2 192 characters.
\A3 256 characters (DEFAULT).

Result Codes:

      OK   n = 0, 1, 2, 3
      ERROR   Otherwise

\Bn   Transmit Break to Remote

In non-error correction mode, the modem will transmit a break signal to the remote modem with a length in multiples of 100ms according to parameter specified. The command works in conjunction with the \K command.

\B1-\B9 Break length in 100ms units. (Default = 3.) (Non-error corrected mode only.)

Result Codes:

      OK   If connected in data modem mode.
      NO CARRIER   If not connected or connected in fax modem mode.

\G   Modem Port Flow Control

\G0: Returns an "OK" for compatibility (default).
\G1: NOT SUPPORTED responds ERROR.

Result Codes:

      OK   n = 0
      ERROR   Otherwise

\J   Adjust Bits/s Rate Control

When this feature is enabled, the modem emulates the behavior of modems that force the DTE interface to the line speed.

\J0: Turn off feature (default).
\J1: Turn on feature.

Result Codes:

      OK   n = 0, 1
      ERROR   Otherwise

\Kn   Break Control

Controls the response of the modem to a break received from the DTE or the remote modem or the \B command. The response is different in three separate states. The first state is where the modem receives a break from the DTE when the modem is operating in data transfer mode:

> \K0 Enter on-line command mode, no break sent to the remote modem.
> \K1 Clear data buffers and send break to remote modem.
> \K2 Same as 0.
> \K3 Send break to remote modem immediately.
> \K4 Same as 0.
> \K5 Send break to remote modem in sequence with transmitted data.
> > (Default.)

The second case is where the modem is in the on-line command state (waiting for AT commands) during a data connection, and the \B is received in order to send a break to the remote modem:

> \K0 Clear data buffers and send break to remote modem.
> \K1 Clear data buffers and send break to remote modem. (Same as 0.)
> \K2 Send break to remote modem immediately.
> \K3 Send break to remote modem immediately. (Same as 2.)
> \K4 Send break to remote modem in sequence with data.
> \K5 Send break to remote modem in sequence with data. (Same as 4.)
> > (Default.)

The third case is where a break is received from a remote modem during a connection:

> \K0 Clear data buffers and send break to the DTE.
> \K1 Clear data buffers and send break to the DTE. (Same as 0.)
> \K2 Send a break immediately to DTE.
> \K3 Send a break immediately to DTE. (Same as 2.)
> \K4 Send a break in sequence with received data to DTE.
> \K5 Send a break in sequence with received data to DTE. (Same as 4.)
> > (Default)

Result Codes:

> OK   n = 0,1, 2, 3, 4, 5
> ERROR   Otherwise

\Nn   Error Control Mode Selection

This command determines the type of error control used by the modem when

sending or receiving data.

\N0: Buffer mode. No error control (same as &Q6).
\N1: Direct mode.
\N2: MNP or disconnect mode. The modem attempts to connect in MNP 2-4
   error control procedure. If this fails, the modem disconnects. This is also
   known as MNP reliable mode.
\N3: V.42, MNP, or buffer (default). The modem attempts to connect in V.42 er-
   ror control mode. If this fails, the modem attempts to connect in MNP mode.
   If this fails, the modem connects in buffer mode and continues operation.
   This is also known as V.42/ MNP auto reliable mode (same as &Q5).
\N4: V.42 or disconnect. The modem attempts to connect in V.42 error control
   mode. If this fails, the call will be disconnected.
\N5: V.42 MNP or buffer (same as \N3)
\N7: V.42. MNP or buffer (same as \N3).

Result Codes:

OK n = 0, 1, 2, 3, 4, 5, 7

\Q   **Local Flow Control Selection**

\Q0: Disable flow control. Same as &K0.
\Q1: XON/XOFF software flow control. Same as &K4.
\Q2: CTS-only flow control. This is not supported, and the response is ERROR.
\Q3: RTS/CTS to DTE (default). Same as &K3.
Result Codes:

OK	n = 0, 1, 3
ERROR	Otherwise

\Rn   **Ring indicator signal off after the telephone call is
                  answered (Compatibility command)**

\R0 ring indicator signal is off after the telephone call is answered

Result Codes:

OK	n = 0
ERROR	Otherwise

\Tn   **Inactivity Timer**

This command specifies the length of time (in minutes) that the modem will wait

before disconnecting when no data is sent or received. A setting of zero disables the timer. Alternatively, this timer may be specified in register S30. This function is only applicable to buffer mode.

Result Codes:

OK	n = 0– 255
ERROR	Otherwise

\Vn   Protocol Result Code

\V0: Disable protocol result code
\V1: Enable protocol result code
\V2: Enable protocol result code

Result Codes:

OK	n = 0, 1, 2
ERROR	Otherwise

\Xn   XON/XOFF Pass Through

\X0 Modem processes XON/XOFF flow control characters locally (DEFAULT).
\X1 Modem processes and pass XON/XOFF flow control characters.

Result Codes:

OK	n = 0, 1
ERROR	Otherwise

-Cn   Data Calling Tone

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of .5 s on and 2 s off.

-CO: Disabled (default).
-C1: Enabled.

Result Codes:

OK	n = 0, 1
ERROR	Otherwise

-V90=x   V.90 Downstream Rate and Control

Use this command to enable/disable V.90 connection and to control V.90 connection rates. The command syntax is *AT-V90=x*. Where *x* is a value from the list below.

AT-V90=x	Downstream Rate
0	V.90 disabled
1	Auto Rate (default)
2	28000 bits / s
3	29333 bits / s
4	30666 bits / s
5	32000 bits / s
6	33333 bits / s
7	34666 bits / s
8	36000 bits / s
9	37333 bits / s
10	38666 bits / s
11	40000 bits / s
12	41333 bits / s
13	42666 bits / s
14	44000 bits / s
15	45333 bits / s
16	46666 bits / s
17	48000 bits / s
18	49333 bits / s
19	50666 bits / s
20	52000 bits / s
21	53333 bits / s

Additional Commands:

AT-V90?	shows the current value and displays the selected rate.
AT-V90=?	show the range (0-21).

%B   View Numbers in Blacklist

If blacklisting is in effect, this command displays the numbers for which the last call attempted in the past two hours failed. The ERROR result code appears in countries that do not require blacklisting.

%Cn   **Enable/Disable Data Compression**

Enables or disables data compression negotiation on an error corrected link.

%C0 Disables data compression
%C1 Enables both V.42 bis and MNP 5 data compression

Result Codes:

      OK   n = 0, 1
      ERROR   Otherwise

AT Commands for Testing and Debugging

The following commands are to be used for testing and debugging only and are not meant for general use.

&Tn   Self-Test Commands

This command allows the user to perform diagnostic tests on the modem. These tests can help to isolate problems when experiencing periodic data loss or random errors.

&T0: Abort. Stops any test in progress.
&T1: Local analog loop. This test verifies modem operation, as well as the connection between the modem and computer. Any data entered at the local DTE is modulated, then demodulated, and returned to the local DTE. To work properly, the modem must be off-line.
&T3: Local digital loopback test.
&T6: Remote digital loopback test. This test can verify the integrity of the local modem, the communications link, and the remote modem. Any data entered at the local DTE is sent to, and returned from, the remote modem. To work properly, the modems must be on-line with error control disabled.

Result Codes:

OK	n = 0
CONNECT	n = 1, 3, 6
ERROR	Otherwise

&&C   Write to/Read from DSP Register

AT&&C<loc>,<val> writes the value <val> to DSP register at location <loc>.
AT&&C<loc> reads from location <loc>.

&&L   Line-to-Line Loopback

This command provides a loopback for line-to-line.

&&R   Write to/Read from DSP RAM Location

AT&&R<loc>,<val> writes the value <val> to DSP RAM location <loc>.
AT&&R<loc> reads from location <loc>.

ATI11   **Display Diagnostic Information for the last modem connection**

The "ATI11" command displays the following diagnostic information for the last modem connection. A value of "NA" will be displayed if that parameter is not applicable for that connection.

Table 1. Diagnostic Information

Description	Example	Comments
Last Connection	V.34	V.90/56K/V.34/V.32 - The last data connection is successful. Failure - The last data connection failed.
Initial Transmit Carrier Rate	33600	The upload connection rate after initial negotiation.
Initial Receive Carrier Rate	33600	The download connection rate after initial negotiation.
Final Transmit Carrier Rate	33600	The last upload connection rate.
Final Receive Carrier Rate	33600	The last download connection rate.
Protocol Negotiation Result	V.42	Possible results are: V.42, MNP or noEC
Data Compression Result	V.42bis	Possible results are: V.42bis, MNP5 or no Compression.
Estimated Noise Level	10	An average of the squared error between the received constellation point and the decision point.
Receive Signal Power Level	20	Receive signal (-dBm)
Transmit Signal Power Level	10	Transmit signal level (–dBm)
Round Trip Delay (msec)	60	Measured Round Trip Delay in ms
Near Echo Level (-dBm)	39	Measured Near Echo Level
Far Echo Level (-dBm)	60	Measured Far Echo Level
Transmit Frame Count	5000	Number of HDLC frames transmitted.

Description	Example	Comments
Transmit Frame Error Count	10	Number of frame errors transmitted
Receive Frame Count	5000	Number of HDLC frames received.
Receive Frame Error Count	10	Number of frame errors received
Retrain and Rate Negotiate Event the local Modem	1	Number of retrains initiated by the local modem.
Retrain and Rate Negotiate Event remote Modem	1	Number of retrains initiated by the remote modem.Call Termination
Call Termination Cause	0	0 -Call Terminated by Local Modem 1 -Call Terminated by Remote Modem 2 -No Answer - the Remote Modem did not answer 3 -Training Failure - the modems failed to negotiate V.34 or 56K protocols. 4 -Protocol Failure - the modems failed to negotiate V.42 protocol.
Robbed-Bit Signaling (56K only) :	12	The number of rob-bits detected during the session.
Digital Loss	0	Digital Loss in dB.
Remote Server I.D.	XXX	The ID number of the remote server.

S-Registers Reference

S-Registers Definitions

S-registers generally affect how the AT commands perform. Contents of the registers can be displayed or modified when the modem is in command mode.

To display the value of an S-register:
        TYPE: ATSn?

where n is the register number.
        PRESS: Enter

To modify the value of an S-register:
        TYPE: ATSn = r

where n is the register number, and r is the new register value.
        PRESS: Enter

S0   **Auto Answer Ring Number**

This register determines the number of rings the modem will count before automatically answering a call. Enter 0 (zero) if you do not want the modem to automatically answer at all. When disabled, the modem can only answer with an ATA command.

Range: 0–255
Default: 0
Units: rings

S1   **Ring Counter**

This register, Ring Counter, is read only. The value of S1 is incremented with each ring. If no rings occur over a six second interval, this register is cleared.

Range: 0–255
Default: 0
Units: rings

S2   **AT Escape Character (user defined)**

This register determines the ASCII valued used for an escape sequence. The default is the + character. The escape sequence allows the modem to exit data mode and enter command mode when on-line. Values greater than 127 disable the escape sequence.

Range: 0–255
Default: 43
Units: ASCII

S3   Command Line Termination Character (user defined)

This register determines the ASCII values as the carriage return character. This character is used to end command lines and result codes.

Range: 0–127, ASCII decimal
Default: 13 (carriage return)
Units: ASCII

S4   Response Formatting Character (user defined)

This register determines the ASCII value used as the line feed character. The modem uses a line feed character in command mode when it responds to the computer.

Range: 0–127, ASCII decimal
Default: 10 (line feed)
Units: ASCII

S5   Command Line Editing Character (user defined)

This register sets the character recognized as a backspace and pertains to asynchronous only. The modem will not recognize the backspace character if it is set to a value that is greater than 32 ASCII. This character can be used to edit a command line. When the echo command is enabled, the modem echoes back to the local DTE the backspace character, an ASCII space character, and a second backspace character. This means a total of three characters are transmitted each time the modem processes the backspace character.

Range: 0–32, 127
Default: 8 (backspace)
Units: ASCII

S6   Wait Before Dialing

This register sets the length of time, in seconds, that the modem must wait (pause) after going off-hook before dialing the first digit of the telephone number. The modem always pauses for a minimum of two seconds, even if the value of S6 is less than two seconds. The wait for dial tone call progress feature (W dial modifier in the dial string) will override the value in register S6. This operation, how-

ever, may be affected by some ATX options according to country restrictions.

Range: 2-65
Default: 2
Units: seconds

S7   Connection Completion Time-Out

This register sets the time, in seconds, that the modem must wait before hanging up because carrier is not detected. The timer is started when the modem finishes dialing (originate), or goes off-hook (answer). In originate mode, the timer is reset upon detection of an answer tone if allowed by country restriction. The timer also specifies the wait for silence time for the @ dial modifier in seconds. S7 is not associated with the W dial modifier.

Range: 1-255
Default: 50
Units: seconds

S8   Comma Dial Modifier Time

This register sets the time, in seconds, that the modem must pause when it encounters a comma (,) in the dial command string.

Range: 0-65
Default: 2
Units: seconds

S10   Automatic Disconnect Delay

This register sets the length of time, in tenths of a second, that the modem waits before hanging up after a loss of carrier. This allows for a temporary carrier loss without causing the local modem to disconnect. The actual interval the modem waits before disconnecting is the value in register S10.

Range: 1-254
Default: 20
Units: 0.1 seconds

S11   DTMF Dialing Speed

This register determines the dialing speed which is prefixed for each country.

Range: 50-150
Default: 95
Units: 0.001 seconds

S12   Escape Guard Time

This register sets the value (in 20 ms increments) for the required pause after the escape sequence (default 1 s).

Range: 0-255
Default: 50
Units: 0.02 seconds

S14   General Bit Mapped Options Status

Indicates the status of command options. Only bit 2 and bit 5 are used, read only.

Bit 3   Result codes (Vn)
                0 = Numeric (V0)
                1 = Verbose (Vl) (Default)

Bit 6   Pulse dial PPS selection (&Pn)
                0 = 10 PPS (&p0, &p1) (Default)
                1 = 20 PPS (&p2)

Default: 8 (00001000b)

S21   V.24/General Bit Mapped Options Status

Indicates the status of command options. Only bits 3, 4 and 5 are used, read only.

        Bits 3-4 DTR behavior (&Dn)
                0 = &D0 selected
                1 = &D1 selected
                2 = &D2 selected (Default)
                3 = &D3 selected
        Bit 5   DCD behavior (&Cn)
                0 = &C0 selected
                1 = &C1 selected (Default)

        Default: 48 (00110000b)

S22   Results Bit Mapped Options Status

Indicates the status of command options. Only bits 4, 5 and 6 are used, read only.

Bits 4-6   result codes (Xn)
                   0 = X0 selected
                   4 = X1 selected
                   5 = X2 selected
                   6 = X3 selected
                   7 = X4 selected (Default)

Bit 7   Pulse dial make/break ratio (&Pn)
                   0 = 33/67 make/break ratio (&P1, &P2) (Default)
                   1 = 39/61 make/break ratio (&P0)

Default: 112 (01110000b)

S24   Timer to Control Sleep Mode

This command displays the number of seconds of inactivity (no characters sent
from the DTE, no RING) in the off-line command state before the modem places
itself into standby mode. A value of zero prevents standby mode.

Note: If a number between 1 and 4 is entered for this register, it will set the value
to 5, and the inactivity before standby will be 5 seconds. This is done for compat-
ibility with previous products which allowed time-outs down to 1 s.

Range: 0, 5-255
Default: 10

S28   V.34 Modulation Enable/Disable

This register enables/disables V.34 modulation.

0 = disabled, 1-255 = enabled,

Range: 0-255
Default: 1

S30   Inactivity Timer

S30 specifies the length of time (in minutes) that the modem will wait before
disconnecting when no data is sent or received. This function is only applicable to
buffer mode.

Range: 0-255
Default: 0
Units: minutes

S32   **Synthetic Ring Volume**

This register specifies a synthetic ring volume in dB with an implied minus sign.

Range:
Default: 16

S33   **Synthetic Ring Frequency**

This register specifies a synthetic ring frequency. Valid ranges are 0-5, with 0= disabled and 1-5 corresponding to 5 ring frequencies.

Range: 0-5
Default: 0

S35   **Data Calling Tone**

Data Calling Tone is a tone of certain frequency and cadence as specified in V.25 which allows remote Data/FAX/Voice discrimination. The frequency is 1300 Hz with a cadence of .5 s on and 2 s off.

0 = disabled, 1 = enabled,

Range: 0-1
Default: 0

S36   **Negotiation Fallback (default 7)**

This register specifies the action to take in the event of negotiation failure when error control is selected.

S36 = 0, 2	Hang up.
S36 = 1, 3	Fall back to an asynchronous connection.
S36 = 4, 6	Attempt MNP. If MNP fails, hang up.
S36 = 5, 7	Attempt MNP. If MNP fails, fall back to asynchronous connection.

S37   **Dial Line Rate (default 0)**

S37 = 0	maximum modem speed
S37 = 1	reserved
S37 = 2	1200 bits/s and 75 bits/s
S37 = 3	300 bits/s

S37 = 4	reserved
S37 = 5	1200 bits/s
S37 = 6	2400 bits/s
S37 = 7	4800 bits/s
S37 = 8	7200 bits/s
S37 = 9	9600 bits/s
S37 = 10	12000 bits/s
S37 = 11	14400 bits/s
S37 = 12	16800 bits/s
S37 = 13	19200 bits/s
S37 = 14	21600 bits/s
S37 = 15	24000 bits/s
S37 = 16	26400 bits/s
S37 = 17	28800 bits/s
S37 = 18	31200 bits/s
S37 = 19	33600 bits/s

S38   **56K Dial Line Rate (default 1)**

There are 2 S-registers which support K56flex connections. S38 sets the maximum K56flex downstream speed that the modem attempts to connect. To disable K56flex, set S38 to 0. The S37 register is used to control the upstream V.34 rate. (Note: Use the *AT-V90=x* command to control V.90 connections)

S38 = 0	K56flex disabled - V.34 connection (see S37)
S38 = 1	K56flex autorate - maximum achievable connection
S38 = 2	32000 bits / s
S38 = 3	34000 bits / s
S38 = 4	36000 bits / s
S38 = 5	38000 bits / s
S38 = 6	40000 bits / s
S38 = 7	42000 bits / s
S38 = 8	44000 bits / s
S38 = 9	46000 bits / s
S38 = 10	48000 bits / s
S38 = 11	50000 bits / s
S38 = 12	52000 bits / s
S38 = 13	54000 bits / s
S38 = 14	56000 bits / s

S40   **ETC Startup Autorating (default 0, range 0-2)**

S20=0	Startup with normal autorating.
S20=1	Startup at initial rate of 4800 or below.

S20=2   Startup at initial rate of 9600 or below.

Range: 0-2
Default: 0

S42   Auto Rate (default 1, range 0-1)

This command is used for testing and debugging only.

V.32bis and V.22bis auto rate is disabled. Retrain operation is disabled or enabled in data mode, and fallback is disabled in data mode.

0 = auto rate disabled, 1 = enabled.

Range: 0-1
Default: 1

S43   Auto Mode (default 1, range 0-1)

This command is used for testing and debugging only.

V.32bis startup auto mode operation disabled.

0 = auto mode disabled, 1 = enabled.

Range: 0-1
Default: 1

S48   LAPM Error Control and Feature Negotiation (default 7)

S48 = 7   Negotiation enabled.
S 48 = 128   Negotiation disabled; forces immediate fallback options specified in S36.

The following chart lists the S36 and S48 configuration settings necessary to negotiate certain types of connections:

	S48=7	S48 =128
S36 = 0, 2	LAPM or hangup	do not use
S36 = 1, 3	LAPM or async	async
S36 = 4, 6	LPAM, MNP, or hangup	MNP or hangup
S36 = 5, 7	LAPM, MNP, or async	MNP or async

S89   **Timer to Control Sleep Mode**

This command displays the number of seconds of inactivity (no characters sent from the DTE, no RING) in the off-line command state before the modem places itself into standby mode. A value of zero prevents standby mode.

Note: If a number between 1 and 4 is entered for this register, it will set the value to 5, and the inactivity before standby will be 5 seconds. This is done for compatibility with previous products which allowed time-outs down to 1 s.

Range: 0, 5-255
Default: 10

S90   **Local Phone Status**

This register tells the status of the local phone. It is read only.

0 = local phone on-hook
1 = local phone off-hook

S91   **Line Transmit Level**

This register is effective only for Japan. It specifies the line transmit level in dB with an implied minus sign.

Range: 6-15
Default: 15
Units: 1 dB

S92   **Direct Connect Transmit Level (default 20)**

Sets the transmit level, in dBm for direct connect. This value may have different settings for different phones.

Table 2. The Result Code Summary

Result Code	Description
OK	Command executed
CONNECT	Modem connected to line
RING	A ring signal has been detected
NO CARRIER	Modem lost carrier signal, or does not detect carrier signal, or does not detect answer tone
ERROR	Invalid command
CONNECT 1200 EC*	Connection at 1200 bits/s
NO DIALTONE	No dial tone detected
BUSY	Busy signal detected
NO ANSWER8	No quiet answer
CONNECT 2400 EC*	Connection at 2400 bits/s
CONNECT 4800 EC*	Connection at 4800 bits/s
CONNECT 9600 EC*	Connection at 9600 bits/s
CONNECT 14400 EC*	Connection at 14400 bits/s
CONNECT 19200 EC*	Connection at 19200 bits/s
CONNECT 7200 EC*	Connection at 7200 bits/s
CONNECT 12000 EC*	Connection at 12000 bits/s
CONNECT 16800 EC*	Connection at 16800 bits/s
CONNECT 300 EC*	Connection at 300 bits/s
CONNECT 21600 EC*	Connection at 21600 bits/s
CONNECT 24000 EC*	Connection at 24000 bits/s
CONNECT 26400 EC*	Connection at 26400 bits/s
CONNECT 28800 EC*	Connection at 28800 bits/s
CONNECT 31200 EC*	Connection at 31200 bits/s
CONNECT 33600 EC*	Connection at 33600 bits/s
CONNECT 38400 EC*	Connection at 38400 bits/s
CONNECT 57600 EC*	Connection at 57600 bits/s
CONNECT 115200 EC	Connection at 115200 bits/s
DELAYED	Delay is in effect for the dialed number
BLACKLISTED	Dialed number is blacklisted
BLACKLIST FULL	Blacklist is full
CONNECT 32000 EC*	Connection at 32000 bits/s, 56K rate
CONNECT 34000 EC*	Connection at 34000 bits/s, 56K rate
CONNECT 36000 EC*	Connection at 36000 bits/s, 56K rate
CONNECT 38000 EC*	Connection at 38000 bits/s, 56K rate
CONNECT 40000 EC*	Connection at 40000 bits/s, 56K rate
CONNECT 42000 EC*	Connection at 42000 bits/s, 56K rate
CONNECT 44000 EC*	Connection at 44000 bits/s, 56K rate
CONNECT 46000 EC*	Connection at 46000 bits/s, 56K rate
CONNECT 48000 EC*	Connection at 48000 bits/s, 56K rate
CONNECT 50000 EC*	Connection at 50000 bits/s, 56K rate
CONNECT 52000 EC*	Connection at 52000 bits/s, 56K rate
CONNECT 54000 EC*	Connection at 54000 bits/s, 56K rate
CONNECT 56000 EC*	Connection at 56000 bits/s, 56K rate
CONNECT 58000 EC*	Connection at 58000 bits/s, 56K rate
CONNECT 60000 EC*	Connection at 60000 bits/s, 56K rate
CONNECT 28000 EC*	Connection at 28000 bits/s, V.90 rate
CONNECT 29333 EC*	Connection at 29333 bits/s, V.90 rate
CONNECT 30666 EC*	Connection at 30666 bits/s, V.90 rate
CONNECT 32000 EC*	Connection at 32000 bits/s, V.90 rate

CONNECT 33333 EC*	Connection at 33333 bits/s, V.90 rate
CONNECT 34666 EC*	Connection at 34666 bits/s, V.90 rate
CONNECT 36000 EC*	Connection at 36000 bits/s, V.90 rate
CONNECT 37333 EC*	Connection at 37333 bits/s, V.90 rate
CONNECT 38666 EC*	Connection at 38666 bits/s, V.90 rate
CONNECT 40000 EC*	Connection at 40000 bits/s, V.90 rate
CONNECT 41333 EC*	Connection at 41333 bits/s, V.90 rate
CONNECT 42666 EC*	Connection at 42666 bits/s, V.90 rate
CONNECT 44000 EC*	Connection at 44000 bits/s, V.90 rate
CONNECT 45333 EC*	Connection at 45333 bits/s, V.90 rate
CONNECT 46666 EC*	Connection at 46666 bits/s, V.90 rate
CONNECT 48000 EC*	Connection at 48000 bits/s, V.90 rate
CONNECT 49333 EC*	Connection at 49333 bits/s, V.90 rate
CONNECT 50666 EC*	Connection at 50666 bits/s, V.90 rate
CONNECT 52000 EC*	Connection at 52000 bits/s, V.90 rate
CONNECT 53333 EC*	Connection at 53333 bits/s, V.90 rate

* EC only appears when the Extended Result Codes configuration option is enabled. EC is replaced by one of the following symbols, depending upon the error control method used:

V42bis—V.42 error control and V.42bis data compression.
V42—V.42 error control only.
MNP 5— MNP class 4 error control and MNP class 5 data compression.
MNP 4— MNP class 4 error control only.
NoEC—No error control protocol.

Appendix B: Communications Regulations

Requirements for End Users:

Notice: The Canadian Department of Communications label identifies certified equipment. This certification means the equipment meets certain telecommunications network requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment users should ensure that connection to the line is allowed by the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a telephone extension cord. Compliance with the above conditions may not prevent degradation of service in certain situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.